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AUTHOR Senese, Donald J.
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ABSTRACT

The future world of students will present challenges for the education community in determining how to educate and properly prepare them for their place in the new information based society. In order to meet the challenges, computers and other technological innovations will have to be used to enhance learning experiences for students, increase teacher productivity, and assist in the development of more effective schools. The Federal Government will assist educators in adopting the use of technology, by continuing programs at both the kindergarten through twelfth grade and higher education levels that explore and/or provide examples of effective uses of instructional technology. The student loan program will continue, as will the Fund for the Improvement of Postsecondary Education (FIPSE). FIPSE has already awarded grants for innovative projects using technology in higher education such as the use of VISICALC for teaching macroeconomics; extending verbal, mathematical, and computer literacy training to adults; developing a computerized textbook in pathology; and designing and implementing a computer assisted academic advisement program using PLATO. Additionally, 12 school-based technology demonstration sites have been established to provide examples for other schools desirous of utilizing technology in their own programs. Another tool of dissemination is the National Diffusion Network, which identifies exemplary programs and assists school districts with their adoption and implementation. (DJR)

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"Impact of the Computer on Educational
Research and Improvement"

by
Dr. Donald J. Senese
Assistant Secretary for Educational
Research and Improvement
U.S. Education Department

Delivered at the Sixth Annual
National Educational Computing Conference
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Donald J. Senese

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Good Morning.

I am delighted to be with you for the 6th Annual National Educational Computing Conference. The purpose and scope of this conference are most impressive. I commend all of you for your interest and leadership in the important area of computer education.

Being here in Dayton, the home of the beautiful, historic, as well as academically prestigious University of Dayton is, I think, particularly appropriate for this conference. I was impressed by the spirit of cooperation of the other area colleges and universities in assisting this conference.

Some of the most significant advancements of the 20th century can be credited to Daytonians: Orville and Wilbur Wright and their flying machine and Charles Kettering, the inventor of the self-starter for the automobile.

Dayton, looking ahead to the dynamic developments expected for the 21st century, is one of the cities at the forefront of our entry into our new "information-based" society. With an increasing focus on high-tech, and technology related industries, these developments will play a significant role in the over-all economy of this city and cities throughout our country.

It is important, at this time, to remember that we are now on the threshold of the 21st century. The students who enter 1st grade next fall will make up the college graduating class of the year 2000! We are now educating in our schools the young people who will be the adult citizens of the 21st century.

In thinking about those 16 years hence it is important to focus on the exciting changes and challenges that will be taking place.

It is staggering when one realizes all of the changes that have taken place even during this past 16 years. Let's look at the road we have traveled since 1968. We have, during that time period, stepped out of the "industrial age" and moved to the entrance way of the "information" age.

During that time, the advent of the microcomputer as an important ingredient of the educational process, as well as everyday life, has taken a place of prominence. The microcomputer, as well as other technological advances, is already improving our ability to educate our young people, perform more efficiently tasks which are a part of our everyday jobs, and greatly improve our lifestyle.

The changes which will take place during the next 16 years will grow in a geometric rather than arithmetic fashion; they will be far greater than those which transpired during the past 16 years.

I think it is safe to say that the future world of the students now in school--the lives they lead, the jobs they perform, the leisure they enjoy--will be quite different from that of today.

Futurists--those who are looking at what the objectives of occupational and educational programs should be in order to meet future needs--have predicted that some of the jobs available to job-seekers of the 21st century will be:

- CAD/CAM worker
- bionic-implant technician
- air quality engineer
- interactive therapist
- waste disbursement manager

One of the greatest challenges facing the educational community is in determining how to educate, and properly prepare, the students now in school for their place in the new "information-based" society.

One of the most important functions of secondary schools, colleges, and universities is to prepare the young people of our nation to become responsible members of society--a part of which includes preparing them with a means for earning a living and for being productive. Having enough skilled workers is an essential aspect of our economy and having the means to increase productivity of those workers will be essential to keeping our nation a dynamic world economic power.

The challenges are great. Just over a year ago, on April 26, 1983, the National Commission on Excellence in Education released its report, entitled A Nation at Risk: The Imperative for Educational Reform. The Commission members spent almost two years studying and reviewing education in America as well as other industrialized nations. In their report they documented a decline in education in the United States that was not only frightening but disheartening. A Nation at Risk and other subsequent reports issued a clarion call for action to turn back the tide of mediocrity and open the floodgates toward excellence.

In addition to the decline in our educational system, many researchers are beginning to analyze test results which they believe show a decline in the national intelligence.

Barbara Lerner of Princeton, New Jersey and formerly of the Educational Testing Service has done pioneer work in this field emphasizing the role of what she refers to as "human capital"; this

concept relates the economics of adults in jobs as it logically follows from children in school. If student performance is on the decline, we will also witness the decline in performance of those same individuals as they become a part of the adult workforce.

It is perhaps an unpleasant notion, the possibility of declining national intelligence, but one which should at least be explored. And, whether or not intelligence is increasing or decreasing, we do know we need better educated people and a greater emphasis on academic achievement. Unless we concentrate on building intelligence, and improving our methods of education, we will end up with shortages of key personnel. In a complex, technology oriented society, literacy will be a minimal requirement of virtually every skilled and many unskilled jobs. We cannot teach the higher skills unless we have students learning the basic skills. We cannot provide a pre-Gutenberg education alone in a post-Gutenberg age. We should help the slow and the disadvantaged student but we ignore at our future peril the gifted and talented student.

We are not the only nation to grapple with such problems. In fact, in order to maintain our place in the international community of leading nations, we must be certain that we have the courage to confront our problems, not behave as observers on the sidelines or bury our heads in the sand. If we turn our backs on our problems in the field of education, other nations who are willing to deal with education issues and the link to increased productivity will move ahead. Our economy, our defense, our way of life are at stake.

A report, on the first anniversary of A Nation at Risk released by the U.S. Department of Education entitled The Nation Responds: Recent Efforts to Improve Education, describes current efforts by individual states to restore excellence to their schools. It is not an easy job---the restoration of excellence---however, the efforts in that direction appear to be very encouraging.

U.S. Secretary of Education, Terrel H. Bell, in his introduction to the report says:

As the National Commission noted a year ago, many schools, districts, and States had already begun the arduous and serious work of reform. The Nation Responds demonstrates that this work is already bearing fruit. It reaffirms, as well, the truth of Dr. Gardner's (the Chairman of the National Commission) observation that the problem of American education can be both understood and corrected if the people and their public officials care enough and are courageous enough to do what is required. The wave of reform sweeping the country demonstrates the abundance of that care and reform.

The advent of the "information-age" despite all its complexities brings with it the means and tools to improve education. It is important for educators to realize this--and to begin to utilize the vast resources at their disposal in order to improve education.

By utilizing the technological means we now have access to, we have the capacity to improve the productivity of the classroom. Teachers can become more effective in their teaching practices; students can become more effective learners. We can through technology enhance learning for students, increase teacher productivity, and develop more effective schools.

The notion of increased productivity in the classroom is particularly promising to those in higher education. In higher education, we discover the conflict between faculty salaries decreasing in real dollars, while tuition is on the increase, coupled with the desire by faculty members to have smaller numbers of students with whom to work.

A case in point is Patrick Suppes, a professor of philosophy at Stanford University. He utilizes technology which enables him to teach thirteen or more classes a year. As described in the Chronicle of Higher Education (October of 1983):

He teaches the philosophy department's "Introduction to Logic" course to 100 students at a time three times a year--by computer. He teaches "Axiomatic Set Theory" by computer. He teaches "Foundations of Measurement" by videotape. And he teaches four or five seminars a year in person.

This new dimension to the learning process will continue to be an ever increasing aspect of higher education. Computers are becoming a part of the equipment that many students take to the college or university. A handful of colleges such as Stevens Institute of Technology (Hoboken, New Jersey), Clarkson College (Potsdam, New York) and Carnegie-Mellon University (Pittsburgh, Pennsylvania) require students to have computers. Computer programs are being designed especially for college classes. College book stores, in some instances, are becoming computer stores.

The computer, as well as other technological innovations, can provide us with a means of offering improved educational opportunities in a cost-effective manner. They can help us develop our human resources to their greatest potential.

Many educators, while aware of the potential benefits these technological innovations hold, may lack the knowledge to adopt technology for use in their educational programs. They eagerly seek guidance and direction.

In order to assist educators in the development of worthwhile programs in technology, U.S. Secretary of Education, T.H. Bell has made technology a primary initiative of the U.S. Department of Education. The Office of Educational Research and Improvement has been given the department's lead role in implementing the "Technology Initiative."

The federal government recognizes the great benefits to higher education of technology and seeks to impose no barriers as institutions of higher education make their decisions on how they will proceed. The Reagan Administration seeks to promote a concept of an opportunity oriented society so these advances can take place with minimal federal interference.

In order to promote less federal control and more State, local and institutional autonomy in education, there will not be a massive federal aid program providing for software and/or hardware for universities. Such a program would pose threats to a university's decision-making powers in the vital area of curriculum.

The federal government will continue programs at both the kindergarten through 12th grade and higher education levels which assist directly and indirectly with the ability of schools, colleges and universities to participate in the technology revolution. The student

loan program will continue to provide grants and loans to students so they follow studies preparing themselves for the new work opportunities in technology.

There is also the FIPSE program (Fund for the Improvement of Postsecondary Education) which operates from our Office of Postsecondary Education. FIPSE makes specific grants for innovative projects in higher education and in recent years under the Reagan Administration these grants have favored projects in technology. Grants for Fiscal Year 1983 included the following projects: teaching macroeconomics using VISICALC software as a classroom lecture complementary activity (Colorado State University); developing a national inventory of micro-computer uses in education and an inventory of the uses of other electronic technologies (Harvard Graduate School of Education); extending verbal, mathematical and computer literacy training to rural adults (University of Idaho); and developing a flexible computerized medical textbook in pathology which allows this "living text" to be continually updated and serve not only as a continuing education system but as an information bank (University of Illinois College of Medicine). In addition, there is funding through FIPSE for developing a computer program to stimulate phenomena in optics, a program which can be used for junior high through graduate school (University of Maryland); establishing an institute to train computer science faculty from small liberal arts colleges in improved teaching methods and in techniques to better meet student needs (Union College, Lincoln, Nebraska); and

designing as well as implementing a computer assisted academic advisement program using the PLATO system (University of Delaware). These grants provide the important funds to develop programs which can be disseminated to other postsecondary institutions.

At the kindergarten through secondary level, other programs are being implemented. The Educational Technology and Science Staff of the Office of Educational Research and Improvement along with the National Center of Education Statistics are involved in a multi-year effort to gather data on "computer use and computer literacy in elementary and secondary education." In the NCES report, Computer Literacy: Definition and Survey Items for Assessment in Schools, the purpose of the project is identified as:

...the development of a definition of computer literacy, a glossary of computer terminology, a short bibliography of computer literacy, and a pool of questions on the use and application of computers in education.

OERI sponsored a conference at the University of Pittsburgh and Carnegie Mellon University in November of 1982. The focus was on research needs of computers. The report of that conference Computers in Education: Realizing the Potential should be helpful to all educators.

Secretary Bell announced at the end of last year awards totalling more than 1.5 million dollars to 12 school-based technology demonstration sites. The purpose of these demonstration sites is to provide examples which other schools and/or school districts can follow. Through this program, we have identified excellent programs which are already being offered, and utilized successfully, in various local districts throughout the United States. The demonstration sites which

were selected are representative of urban, suburban, and rural areas. Educators can look at these programs and see ways that they might be able to utilize technology in their own programs.

Another effective tool of dissemination is the National Diffusion Network which identifies exemplary programs and assists school districts in the adoption and implementation of these programs. It utilizes the knowledge of successful programs which can be used in other areas to bring the knowledge of good educational practices to other school districts and to avoid duplication of effort. The NDN network has already assisted many school districts in their entry into the age of technology.

The main thing we must remember is that we should not be overwhelmed by all of the complexities that face us into a frenzy of inaction. There is one thing certain about our entry into the information age---education will be the hallmark of that new age. And that does not mean just one "formal" education but rather a lifetime of education. Up to the present decade one education would prepare you for a lifetime in most careers. Today, most adults will require re-education, or re-training every 5 to 10 years--four or five re-educations throughout a lifetime.

During the 1960s and 1970s our nation suffered a malaise-- a lowering of expectations and a decline in hope. The feeling seemed to be pervasive that our great accomplishments were in the past and that the future presented a hopelessness for ourselves and our society as we experienced more pollution, running out of resources and supposed

problems like over-population and nuclear war. The prognostications of the Club of Rome became a club of doom, a sword of Damocles hanging over our heads and the heads of our young people.

However, there does seem to be a spirit of renewed optimism. We have a tendency to accept as routine the benefits in a society while concentrating on the negatives. Fortunately technology presents to us an unlimited capacity to imagine greater developments in our economy, our standard of living, the expansion of cultural opportunities and increased productivity. In his last book, The Coming Boom, the late Herman Kahn noted that he expected high and sustained growth through the 1980s and 1990s because of a whole host of new technologies and technological improvements ready for large scale development. We need as a nation a collective optimism and enthusiasm and will to develop this technology so that we will not become the tired and burdened and have our nation slump into the roll call of nations which once had been great but lost the will to survive. We as a nation once conquered the plains and the forests of this new nation to build our cities and our farms; the challenge of technology represents a new frontier for the United States to further develop an opportunity oriented society for all.

It is an awesome challenge but one for which all are becoming more and more prepared. Organizations such as yours, and the work that you do, are excellent examples. I commend you and wish you well in the exciting opportunities all of us face.